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MATERNAL AND CHILD HEALTH STATISTICS IN NORTH CAROLINA OVER THE LAST DECADE

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Introduction

North Carolina routinely collects information on maternal characteristics that are known risk factors for conditions associated with fetal, neonatal and postneonatal deaths. These maternal risk characteristics are derived from information recorded on birth certificates and include young and old age, low educational status, out of wedlock, high parity, a previous fetal death or a child born alive but who is now dead (1). Other factors which are not routinely collected but which are known to play important roles in birth outcome include genetic factors, environmental factors (for example, exposures to various toxins in the atmosphere or food) and infectious diseases. There are, no doubt, many others. Therefore, many questions of interest to health officials concerned with fetal, neonatal and postneonatal mortality cannot be answered on the basis of routinely recorded birth and death data but rather require in-depth special studies. However, many questions can be examined on the basis of these data. In particular, it is incumbent upon health officials to periodically examine the known recorded maternal characteristics that have traditionally been associated with risk to deliveries in order to see if the risks are changing and, if so, in what direction, and to see if the distribution of risk characteristics among delivering women changes, and, if so, how. Also, questions regarding risk in various regions of the state may be answered from these data.

The following definitions apply to this study:

Live Birth - A live birth is the complete expulsion or extraction from its mother of a product of human conception, irrespective of the duration of pregnancy, which, after such expulsion or extraction, breathes or shows any other evidence of life, whether or not the umbilical cord has been cut.

Fetal Death - A fetal death (stillbirth) is death prior to complete expulsion or extraction from its mother of the product of conception. This report shows only registered fetal deaths of 20 or more weeks gestation that were not recorded as abortions.

Neonatal Death - A neonatal death is the death of a liveborn child under 28 days of age. This report shows only matched neonatal deaths. A matched neonatal death is one which is matched with a birth certificate.

Postneonatal Death - A postneonatal death is the death of a liveborn child of 28 days to one year of age. Only matched postneonatal deaths are displayed in this report. A matched postneonatal death is one which is matched with a birth certificate.

Rates are calculated by the following formulas:

$$\text{Five-year fetal death rate} = \frac{\text{Five-year number of fetal deaths}}{\text{Five-year number of live births plus the five-year number of fetal deaths}} \times 1{,}000$$

$$\text{Five-year neonatal death rate} = \frac{\text{Five-year number of neonatal deaths}}{\text{Five-year number of live births}} \times 1{,}000$$

$$\text{Four-year postneonatal} = \frac{\text{Four-year number of postneonatal deaths}}{\text{Four-year number of live births minus the four-year number of neonatal deaths}} \times 1{,}000$$

These rates are calculated for each of the following 15 groups of maternal characteristics (1):

Age (at last birthday)
- Under 18*
- 18-34 years
- 35+ years*

Education (grades completed)
- Under 9 years*
- 9-11 years*
- 12+ years

Out of Wedlock
- Yes*
- No

Parity
- 1
- 2-3
- 4+*

Previous Fetal Death
- Yes*
- No

Previous Live Born Now Dead
- Yes*
- No

*maternal risk group, see Reference 1.

The trend analysis here has made use of two previous publications which covered the periods 1969-73 and 1972-76 (2,3) as well as the present analysis of the 1975-79 data. (This accounts for the overlapping periods in parts of the report.)

A total of 4,939 resident <u>fetal</u> deaths occurred during 1975 through 1979, and 932 or 19 percent of these occurred during 1979. The five-year fetal death rate was 11.8 per 1,000 deliveries. This rate compares with a rate of 13.9 for 1972 through 1976 (3) and 15.7 for 1969 through 1973 (2).

A total of 4,746 <u>neonatal</u> deaths occurred to residents born during 1975 through 1979, and 850 or 18 percent of these occurred among 1979 births. The overall five-year neonatal rate was 11.5 per 1,000 live births. This rate

compares with a rate of 14.3 for 1972 through 1976 (3) and 16.5 for 1969 through 1973 (2).

A total of 1,512 postneonatal deaths occurred to residents born during 1975 through 1978, and 364 or 24 percent of these were among 1978 births. The overall four-year postneonatal death rate was 4.7 per 1,000 neonatal survivors; this rate compares with a rate of 5.3 for 1972 through 1975 (3) and 6.0 for 1969 through 1972 (2).

This report focuses on various components of these trends. For a more detailed analysis of the section Maternal Risk Factors, see reference 4.

Maternal Risk Factors

Table 1 summarizes some of the important epidemiologic information about fetal, neonatal and postneonatal death rates over the latter half of the decade. Out of eight risk factors considered, the most serious maternal risk factor for fetal death is for the mother to be of "older" age (age >34) at the time of delivery. The greatest risk factor for a neonatal death is for the mother to have had a previously liveborn child who has since died, suggesting familial or home environmental risk factors. The postneonatal mortality rate is highest among mothers of low educational attainment (Educ <9).

Table 1

Numbers of Deaths and Mortality Rates in the Maternal Risk Groups with the Highest Rates and in Total, by Race and Type of Mortality

	Fetal			Neonatal			Postneonatal		
		No.	Rate		No.	Rate		No.	Rate
White	(Age >34)	192	18.6	(PLBND)	176	26.2	(Educ <9)	87	7.9
	(Total)	2,661	9.4	(Total)	2,645	9.5	(Total)	733	3.3
Nonwhite	(Age >34)	169	33.3	(PLBND)	194	34.6	(Educ <9)	85	12.4
	(Total)	2,278	16.9	(Total)	2,101	15.8	(Total)	779	7.5

Note that the maternal risk factors implicated here are the same in both race groups, although the mortality rates are higher among nonwhites than among whites.

Although the rates are high in these groups, the number of deaths over the five-year period (four-year for postneonatal deaths) account for a relatively small proportion of deaths in comparison to the numbers of deaths within other maternal risk groups. Table 2 provides a summary in the same format as Table 1 but it focuses on the maternal risk group with the largest number of deaths (rather than greatest rate or risk of death). The risk groups with the largest numbers of deaths are comprised of women with relatively low educational attainment and women who have given birth out of wedlock. This pertains to each of the three mortality categories.

The proportion of deliveries to women possessing risk characteristics has declined over the past decade, except that the proportion of out of wedlock deliveries and deliveries to women who had a previous fetal death (PFD) increased. These trends pertain to whites and nonwhites. The same pattern pertains to numbers of deliveries except that the number of deliveries in the white PFD group has increased only in the latter part of the decade. Also, the overall proportion

and number of fetal, neonatal, and postneonatal deaths within the maternal risk population decreased over the decade.

Table 2

Numbers of Deaths and Mortality Rates in the Maternal Risk Groups with the Highest Numbers of Deaths by Race and Type of Mortality

	Fetal*			Neonatal*			Postneonatal*		
		No.	Rate		No.	Rate		No.	Rate
White	(Educ 9-11)	725	10.5	(Educ 9-11)	787	11.5	(Educ 9-11)	262	4.8
Nonwhite	(OW)	1,065	18.5	(OW)	1,037	18.4	(Educ 9-11)	416	10.7

*See Table 1 for overall race-specific numbers and rates.

Mortality rates for deliveries to mothers in the risk groups and in the state as a whole are decreasing for whites and for nonwhites, though the mortality rates for whites are lower than those for nonwhites. Table 3 displays the percent change in these mortality rates in the risk groups from the 1972-76 period through the 1975-79 period. All rates decreased except for the postneonatal mortality rate for nonwhite mothers under 18 years of age; that rate remained constant. In general, the decline in rates was greater for whites than for nonwhites; in particular, the neonatal rate for whites dropped by 23 percent compared to 15 percent for nonwhites.

Prematurity

Prematurity continues to be a major risk factor. The five-year fetal mortality rate for premature deliveries was 89.3 whereas the rate for mature deliveries was 3.6--a twenty-five-fold excess mortality in the case of premature infants. Premature infants experienced a neonatal five-year mortality rate of 107.6 whereas the rate for mature births was 2.6--a forty-one-fold excess mortality in the case of prematurity. Prematures experienced a postneonatal five-year rate of 16.7, whereas the rate for matures was 3.7--more than a four-fold excess postneonatal mortality for premature infants.

Table 4 presents fetal, neonatal and postneonatal mortality rates over time for birth weight groups, by race. Generally, the trend is consistent with findings presented earlier, that the mortality rates are decreasing for both race groups.

One interesting exception is observed, however. Among infants with a birth weight of less than 1501 grams the postneonatal death rate has increased. This trend involves both whites and nonwhites. It is possible that better perinatal care has prolonged the lives of high risk infants, as reflected by a decrease in the fetal and neonatal death rates for low birth weight deliveries, more of whom then die in the postneonatal period. Again, the increasing postneonatal death rate pertains only to the low birth weight group, and the trend is not apparent in the general population.

Another notable observation from the data of Table 4 is that nonwhites generally have lower fetal and neonatal mortality rates among deliveries under 2501 grams. The reason for this is not definitely known, though it is possible

Table 3

Percent Change in Mortality Rates for Risk Factors
in North Carolina from the 1972-76 Period
Through the 1975-79 Period*

	Whites			Nonwhites		
Risk Factor	Fetal	Neonatal	Postneonatal	Fetal	Neonatal	Postneonatal
Age <18	-20	-19	-16	-12	- 9	0
Age >34	-15	-22	-40	-26	-16	-26
Educ <9	-11	-29	-16	-25	-16	- 9
Educ 9-11	-17	-21	-11	-11	-15	- 9
OW	-17	-18	-19	-13	-12	- 5
Para 4+	-21	-22	-29	-18	-14	-26
PTD	-21	-21	-20	-15	-18	-26
PLBND	-25	-27	-30	- 6	-15	-14
≥One Factor	-17	-22	-14	-13	-15	-15

*Postneonatal deaths cover only the first four years of the period.

Table 4

Trends in the Relation Between Risk and Prematurity:
Fetal (F), Neonatal (N) and Postneonatal (P) Mortality Rates

Race	Birthweight (Grams)		1969-73*	1972-76*	1975-79*
White	<1501	F	336	316	304
		N	650	604	517
		P	37	45	55
	1501-2500	F	48	41	32
		N	64	55	37
		P	12	14	10
	>2500	F	5	4	3
		N	4	3	3
		P	3	3	3
Nonwhite	<1501	F	310	292	278
		N	571	527	453
		P	55	53	62
	1501-2500	F	45	40	34
		N	39	30	22
		P	21	19	15
	>2500	F	7	6	4
		N	5	4	3
		P	9	7	6

*Postneonatal deaths cover only the first four years of the period.

that low birth weight nonwhites are of a higher gestational age than whites and therefore have greater survival potential at a given birth weight. Further study of the reasons for this pattern is needed.

Geographic Patterns of Rates

Analyses of geographic patterns of fetal, neonatal and postneonatal rates were based on DHR Regions (four of them) and Multi-county Planning Regions (18 of them). These geographic units were chosen because they are optimally structured to depict any east-west gradient.

Table 5 depicts the basic pattern. The patterns for whites are opposite those for nonwhites. The pattern pertains to all deliveries and to deliveries by mothers who are in at least one risk group.

An interesting point is that the western predominance of fetal and postneonatal deaths for whites, while statistically significant, does not involve a large difference in the magnitude of the rates. In combining whites and nonwhites, it appears that little difference exists between the eastern and western parts of the state with regard to fetal, neonatal and postneonatal mortality experience. However, other information suggests that sudden infant death syndrome, a major component of postneonatal mortality, is still predominately an eastern phenomenon although there is an increasing westward trend for the reported incidence of this cause of death.

A more detailed accounting of the geographic patterns of these types of mortality will be the subject of a future report.

Table 5

Geographic* Patterns of High Mortality Rates

	Fetal	Neonatal	Postneonatal
White	W+	E	W+
Nonwhite	E	W	E

*W = west (multi-county planning regions ABCDEFI)
E = east (multi-county planning regions LMNOPQR)
+Significant difference (W vs. E) at .05 level.

REFERENCES

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